

Nalco Docket No.: 7560-NES  
Customer No. 000049459

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**CLAIMS**

1. (canceled)
2. (canceled)
3. (canceled)
4. (canceled)
5. (canceled)
6. (canceled)
7. (canceled)
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10. (canceled)
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15. (canceled)
16. (canceled)
17. (canceled)

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18. (canceled)
19. (canceled)
20. (canceled)
21. (canceled)
22. (canceled)
23. (canceled)
24. (canceled)
25. (canceled)
26. (canceled)
27. (canceled)
28. (currently amended) A demulsifier composition comprising oligo- and polymeric compounds, wherein the oligo- and polymeric compounds are selected from the group consisting of compounds prepared by reaction of a) an amine having only two reactive amino hydrogens, b) an aliphatic or cycloaliphatic epoxidized olefin having two epoxide groups, and c) a second amine monomer having only two reactive amino hydrogens and a tertiary amine group and optional subsequent reaction of epoxy groups of the oligo- and polymeric reaction products with an amine capping monomer having one or two reactive amino hydrogens and optional subsequent reaction of amine groups of the oligo- and polymeric reaction products with an N-alkylating agent selected from epichlorohydrin or epibromohydrin reacted polyalkoxide compounds which comprise an oxyalkylene group selected from polyethoxy groups and polypropoxy groups in a propoxy to ethoxy ratio of from about 9 to 1 to about 1 to 9 and methoxy-capped polyethylene oxide.
29. (canceled)

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- 30. (canceled)
- 31. (canceled)
- 32. (canceled)
- 33. (canceled)
- 34. (canceled)
- 35. (canceled)
- 36. (canceled)
- 37. (canceled)
- 38. (canceled)
- 39. (canceled)
- 40. (canceled)
- 41. (canceled)

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42. (previously presented) A demulsifier composition comprising the oligo- and polymeric reaction products of at least one first amine having only two reactive hydrogens, selected from the group consisting of methylamine, ethylamine, propylamine, butylamine, sec-butylamine, isobutylamine, 3,3-dimethylbutylamine, hexylamine and benzylamine, 2-amino-1-butanol, 4-amino-1-butanol, 2-amino-2-methyl-1-propanol, 6-amino-1-hexanol, ethanolamine, propanolamine, tris(hydroxymethyl) aminomethane, D-glucamine, 3-amino-1,2-propanediol, 2-amino-2-methyl-1,3-propanediol, 2-amino-2-ethyl-1,3-propanediol, 3-(dimethylamino)propylamine, N,N-dimethylethylenediamine, N,N-diethylethylenediamine, 1-(2-aminoethyl)piperidine, 4-(2-aminoethyl)morpholine, 2-(2-aminoethyl)-1-methylpyrrolidine, 1-(2-aminoethyl)pyrrolidine, 2-(2-aminoethyl)pyridine, 2-(2-aminoethylamino)ethanol, piperazine, 2-methyl piperazine, 2,6-dimethylpiperazine, 2-(methylamido)piperazine, N,N'-bis(2-hydroxyethyl)ethylenediamine, N,N'-dimethylethylenediamine, N,N'-dimethyl-1,4-phenylenediamine and N,N'-dimethyl-1,6-hexanediamine;
- (b) at least one second amine having only two reactive amino hydrogens and a tertiary amine group selected from the group consisting of 3-(dimethylamino)propylamine, N,N-dimethylethylenediamine, N,N-diethylethylenediamine, 1-(2-aminoethyl)piperidine, 4-(2-aminoethyl)morpholine, 2-(2-aminoethyl)-1-methylpyrrolidine, 1-(2-aminoethyl)pyrrolidine, and 2-(2-aminoethyl)pyridine;
- (c) at least one diepoxy-containing compound said diepoxy compound selected from the group consisting of: bis(2,3-epoxypropyl)ether, diglycidyl ether of 1,4-butanediol, diglycidyl ether of neopentyl glycol, diglycidyl ether of ethylene glycol, glycerol diglycidyl ether, diglycidyl ether of polyethyleneglycol, diglycidyl ether of polypropylene glycol, the diglycidyl ether from the reaction product of ethylene oxide with propylene oxide, diglycidyl ester of cyclohexane dimethanol and diglycidyl ester of a dimer acid, 1,2,3,4-diepoxybutane; 1,2,7,8-diepoxyoctane; 1,2,9,10-diepoxydecane and 1,2,5,6-diepoxyoctane;

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- (d) at least one amine capping monomer having one or two reactive amino hydrogens, wherein said capping monomer is reacted with terminal epoxy groups on said oligo- and polymeric reaction products, the amine capping monomer being selected from the group consisting of diethanolamine, diisopropanolamine, N-methyl-D-glucamine, N-methylpropylamine, dimethylamine, diethylamine, dipropylamine, diisopropylamine, N,N,N'-trimethyl-1,3-propanediamine, N,N,N' - trimethylethylenediamine, N,N-dimethyl-N'-ethylethylenediamine, N,N,N'-triethylethylenediamine; and
- (e) at least one N-alkylating epichlorohydrin capped polyalkylene glycol methyl ether having the following formula:

$R8-O-[CH_2-CH(R9)-O]_n-CH_2-CH(OH)-CH_2-X$  where:

R8 is hydrogen, C<sub>1</sub> to C<sub>6</sub> alkyl, C<sub>6</sub>-C<sub>10</sub> aryl, 2-hydroxy-3-chloropropyl, or 2,3-oxopropyl,

R9 is hydrogen, or C<sub>1</sub> to C<sub>6</sub> alkyl,

X is a halogen atom, and n in the range of 1 to 120.

43. (previously presented) The demulsifier composition according to claim 42, further comprising the oligo- and polymeric reaction product of an amine having only two reactive amino hydrogens selected from the group consisting of; 2-(2-aminoethoxy) ethanol;  
 $CH_3OCH_2CH_2O[CH(-CH_3)CH_2O]_nCH_2CH(-NH_2)CH_3$  where n is at least one;  $CH_3-O-(CH_2CHR-O)_n-CH_2CH(-CH_3)NH_2$  where n is at least one; and  $H_2N-CH_2CH_2OCH_2CH_2-OH$ , a diepoxy-containing compound, and a triepoxy-containing compound.

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44. (previously presented) A demulsifier composition comprising oligo- and polymeric reaction products of

(a) a first amine having only two reactive amino hydrogens selected from the group consisting of: ethanolamine, propanolamine, and polyoxyalkylamines according to the formula

$R_4-(CH_2CH(R_5)O)_n-CH_2CH(CH_3)NH_2$ , where  $R_4$  is  $-OCH_3$ ,  $R_5$  is hydrogen or  $-CH_3$ , and  $n$  is 1 to 45, 2-(2-aminoethylamino)ethanol, piperazine,  $N,N$ -bis(2-hydroxyethyl)ethylenediamine, and  $N,N'$ -dimethylethylenediamine and mixtures thereof;

(b) a diepoxy compound selected from the group consisting of diglycidyl ether of 1,4-butanediol, diglycidyl ether of neopentyl glycol, diglycidyl ether of ethylene glycol, diglycidyl ether of polyethyleneglycols, 1,2,3,4-diepoxybutane, 1,2,7,8-diepoxyoctane and mixtures thereof;

(c) an amine capping monomer having one or two reactive amino hydrogens subsequently reacted with terminal epoxy groups, selected from the group consisting of diethanolamine,  $N$ -methyl-D-glucamine,  $N$ -methylpropylamine,  $N,N,N'$ -trimethyl-1,3-propanediamine,  $N,N,N'$ -trimethylethylenediamine, and mixtures thereof, and;

(d) an  $N$ -alkylating epichlorohydrin capped polyalkylene glycol methyl ether-containing group having the formula:



where  $n$  is 100 to 113 and  $R_9$  is selected from the group consisting of hydrogen and a  $C_1$  to  $C_6$  alkyl group.

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45. (previously presented) The demulsifier composition according to claim 44, wherein (a) further comprises a second amine monomer having only two reactive amino hydrogens and a tertiary amine group selected from the group consisting of 3-(dimethylamino)propylamine, N,N-dimethylethylenediamine, and mixtures thereof.
46. (previously presented) The demulsifier composition according to claim 44, further comprising at least one C<sub>1</sub> to C<sub>16</sub> alcohol and at least one acid-containing compound.
47. (previously presented) The demulsifier composition according to claim 46 further comprising a compound selected from the group consisting of alkyleneoxide copolymers, oxyalkylated alcohols, organo-phosphate esters, inorganic phosphate esters, polyglycols, resole resins, novalac resins and mixtures thereof.
48. (previously presented) The demulsifier composition according to claim 46 further comprising, an acid selected from the group consisting of arylalkylsulfonic acid; aqueous hydrochloric acid, hydrofluoric, sulfamic, acetic acid, formic acid, nitric acid, citric acid, ethylenediaminetetraacetic acid, nitriloacetic acid and mixtures thereof.
49. (previously presented) A method of treating an oil bearing formation comprising the steps of: charging an oil bearing formation with an effective amount of the demulsifier composition according to claim 46 blended per 1000 gallons of an aqueous organic or aqueous inorganic acid solution.
50. (previously presented) The method of treating an oil bearing formation according to claim 49 wherein the effective amount of demulsifier composition is in the range of 0.01 to about 5 gallons per 1000 gallons of an added aqueous acidic solution.
51. (canceled)
52. (canceled)
53. (canceled)

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54. (canceled)
55. (previously presented) The method of claim 51, further characterized by reacting 0.7 to 1.2 moles of at least one amine having only two active amino hydrogens, and a second amine monomer having only two reactive amine hydrogens and a tertiary amine group with one mole of diglycidyl ether of a glycol or epoxidized olefin between 25 °C to 240 °C for a time period sufficient for the reaction product to reach a viscosity of at least 80,000 cps.
56. (original) The method of claim 51 further characterized by grafting an N-alkylating agent onto the polymer by reacting the polymer and N-alkylating agent a weight ratio of between 1:1 to 8:1 at a pH between 7.5 and 9.0 at a temperature between 60 °C and 95 °C for a time period sufficient to reach a solution viscosity between 200 and 9000 cps.
57. (original) The method of claim 51 further characterized by grafting the N-alkylating agent onto the polymer at a weight ratio of between 1:1 to 8:1 of polymer to N-alkylating agent, at a pH between 7.5 and 9.0 and at a temperature between 85 °C and 95 °C for a time sufficient to produce a viscosity between 200 and 5000 cps.
58. (original) The method of claim 51 wherein the N-alkylating agent is epichlorohydrin capped polyalkylene glycol methyl ether.
59. (previously presented) The method of claim 51 further comprising the step of protonating the polymeric reaction product after steps a and b with an acid.



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60. (previously presented) A demulsifier composition comprising the polymeric reaction product of

1) 0.8:1 to about 1.3:1 molar equivalents relative to diepoxy-containing compound of at least one first amine-containing group having only two reactive amino hydrogens selected from the group consisting of

(a) methylamine, ethylamine, propylamine, butylamine, sec-butylamine, isobutylamine, 3,3-dimethylbutylamine, hexylamine, benzylamine, 2-amino-1-butanol, 4-amino-1-butanol, 2-amino-2-methyl-1-propanol, 6-amino-1-hexanol, ethanolamine, propanolamine, tris(hydroxymethyl)aminomethane, 1-amino-1-deoxy-D-sorbitol (D-glucamine), 3-amino-1,2-propanediol, 2-amino-2-methyl-1,3-propanediol, 2-amino-2-ethyl-1,3-propanediol, 3-(dimethylamino)propylamine, N,N-dimethylethylenediamine, N,N-diethylethylenediamine, 1-(2-aminoethyl)piperidine, 4-(2-aminoethyl)morpholine, 2-(2-aminoethyl)-1-methylpyrrolidine, 1-(2-aminoethyl)pyrrolidine, 2-(2-aminoethyl)pyridine, 2-(2-aminoethylamino)ethanol, piperazine, 2-methyl piperazine, 2,6-dimethylpiperazine and 2-(methylamido)piperazine, N,N'-bis(2-hydroxyethyl)ethylenediamine, N,N'-dimethylethylenediamine, N,N'-dimethyl-1,4-phenylenediamine and N,N'-dimethyl-1,6-hexanediamine;

(b) amines of formula  $\text{NH}_2\text{-R1-Z1}$ ; and

(c) amines of formula  $\text{HN (R1Z1)-R3-NH- (R1Z1)}$ ;

wherein R1 is  $(\text{-CH}_2\text{-CH}_2\text{-O-})_n$ ,  $(\text{-CH}_2\text{-CH}(\text{-CH}_3)\text{-O-})_n$ , or  $(\text{-CH}_2\text{-CH}_2\text{-O-})_m\text{-(CH}_2\text{CH}(\text{-CH}_3)\text{-O-})_p$  where n, m and p are 1 to 45; R3 is a  $\text{C}_2\text{-C}_{20}$  alkylene or  $\text{C}_2\text{-C}_{20}$  substituted alkylene wherein the substituent are selected from the group consisting of alkylamido, hydroxy, alkoxy, halo, cyano, aryloxy, alkylcarbonyl, arylcarbonyl, and mixtures thereof; and Z1 is hydrogen, alkyl or acyl;

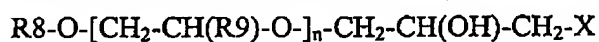
2) at least one diepoxy-containing compound selected from compounds of formula: Epoxy- $\text{CH}_2\text{-O-(R6-O)}_n\text{-CH}_2\text{-Epoxy}$ ; and Epoxy- $\text{CH}_2\text{-R7-CH}_2\text{-Epoxy}$

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wherein R6 is selected from C<sub>2</sub> to C<sub>20</sub> alkylene; alkyl substituted C<sub>2</sub> to C<sub>20</sub> alkylene, C<sub>2</sub> to C<sub>40</sub> alkoxy, and C<sub>2</sub> to C<sub>40</sub> hydroxy substituted alkoxy; n is 0 to 20; and R7 is a C<sub>2</sub> to C<sub>20</sub> alkylene, or a substituted alkylene; and

3) subsequently reacting the polymeric reaction product of 1) and 2) with at least one N-alkylating agent selected from the group consisting of epihalohydrin capped polyalkylene glycol methyl ether of formula



wherein R8 is selected from hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>6</sub>-C<sub>10</sub> aryl, 2-hydroxy-3-chloropropyl and 2,3-oxopropyl; R9 is selected from hydrogen and C<sub>1</sub> to C<sub>6</sub> alkyl; n is 1 to 120; and X is a halogen atom.

61. (canceled)

62. (canceled)

63. (canceled)